

Philip (A. P. W.)
OBSERVATIONS

ON THE NATURE OF
MALIGNANT CHOLERA,
WITH A
VIEW TO ESTABLISH CORRECT PRINCIPLES
OF ITS
PREVENTION AND TREATMENT:

DRAWN UP AT THE REQUEST OF THE
WESTMINSTER MEDICAL SOCIETY.

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As it would be impossible, without too much extending the following observations, to enter at length on every part of the subject, I shall endeavour to bring before the reader all the most essential parts, and for others refer to particular passages of the Treatises on collateral subjects, which I have had occasion from time to time to lay before the public.

SINCE the following pages were printed, I have seen an account of the cold method of treating malignant cholera, practised at Berlin, and it is said also at Vienna, with very favourable results. If this account be confirmed, even although not to its full extent, it will effect a great improvement in the treatment of the disease. It seems at first view extraordinary, in a disease whose leading feature is a deficiency of the natural warmth, that cold should prove a remedy; but it appears from what I have had occasion to lay before the reader, that if we can by a sufficiently powerful impression, rouse the energies of the nervous system in malignant cholera, the natural warmth will not long be defective.

INTRODUCTION.

THE Westminster Medical Society having done me the honour to request me to state my opinion respecting the nature of the Malignant Cholera, the following observations were drawn up, and read at a meeting of the Society on the 17th inst. As some have supposed that their farther publication may at this time be of service, they are here, with some additions, addressed more generally to the members of our profession.

WHEN we are altogether ignorant of the nature of a disease, our practice necessarily rests on the simple principle of what has formerly been found useful, or on our general knowledge of the laws of the animal economy. It is not till we have become acquainted with its nature, that our endeavours can be directed to restore the due functions of the organs primarily affected, on which the affection of all the rest depends: and when in any particular disease we have, after the lapse of a considerable time, gained this knowledge, we often perceive that many parts of our plans of treatment have been superfluous, and others, although affording temporary relief, on the whole injurious; while on the other hand, some well adapted to the disease, and occasionally employed in it, have been allowed to fall into neglect, for want of a knowledge of the principle on which they operated. The treatment it is evident, under such circumstances, must always be wavering and inefficacious. Such, and perhaps in a great degree for the reasons here pointed out is at present that of the malignant cholera.

It has been lately introduced, or at least known as a distinct disease, and the attempts which have been made to

elucidate its nature, have not hitherto been successful. It may therefore appear presuming in me to suppose that I can throw more light upon it than my predecessors; but having for nearly twenty years been engaged in an inquiry into the laws of the vital functions, and having ascertained several points which appear to me to remove the difficulties which others have had to contend with, I am induced to make the following statements:—

To myself, indeed, the malignant cholera appears to be one of the diseases which, depending on those laws of our frame that are capable of being traced by experiment, admit of being better understood than many with which we have long been familiar. I shall, in the first place, give a general view of what appears to me to be the nature of the disease, and then consider its leading symptoms individually, which is necessary to a clear understanding of the subject; endeavouring to point out, on very simple principles, that all the symptoms of malignant cholera are the necessary consequences of any cause capable of making the peculiar impression on the system which its cause, of whatever nature it may be, evidently does. Of the success of the attempt I am about to make, I must leave others to judge, but all will admit that if it be successful, it will tend to establish the practice on rational principles, and consequently to render it steady and determinate.

It is here necessary, in order to make what I am about to say understood, to refer to certain parts of the investigation just mentioned, which I shall do as concisely as I can; and to save frequent interruptions, I beg at once to observe that all the physiological facts to which I shall have occasion to refer, the reader will find in the third edition of my *Enquiry into the Laws of the Vital Functions*, and my papers in the *Philosophical Transactions* of 1815, 17, 22, 27, 28, 29, and 31. The title of these papers will shew to which to refer on each particular subject.

It appears from direct experiment, that the more perfect


animals possess three distinct powers—the sensorial, nervous, and muscular powers; that none of these powers have any direct dependence on the others, but are all so connected through their organs, that each is more or less directly capable of influencing the others, and none can long survive the destruction of any one. The sensorial power is capable of directly influencing the organs of the nervous power, even to the immediate and total destruction of that power. The same is true of the influence of the nervous on the organs of the muscular power throughout every part of our frame; and although the muscular power has no such direct influence on the organs of either of the preceding powers, it has through the medium of the circulation, an influence of equal extent on them.

It is essential, in either tracing the laws of the animal economy in health, or in unfolding the nature of its diseases, that we should be able clearly to determine what functions belong to each of these powers, and very many experiments have been made in the course of my investigations, with a view to determine this point.

The function of the muscular power being simple and well defined, is easily distinguished. In distinguishing the numerous and more complicated functions of the sensorial and nervous powers, there is more difficulty.

In order, with greater certainty to determine the line of distinction between them, two sets of experiments, conducted on different principles, were made; the object of the one being to determine what functions cease after the nervous power is withdrawn, and of the other, what functions remain after the removal of the sensorial power; and the results of these sets of experiments in all respects corresponded, and therefore served to confirm each other.

From them it appeared that the functions of the nervous power are, 1st, under certain circumstances to excite the muscles of involuntary motion, those of voluntary motion being universally admitted to be excited by this power



alone, while the former, in all their usual functions, are excited by stimulants peculiar to themselves ; 2dly, to cause a disengagement of heat from arterial blood, by which the temperature of the animal body is maintained ; 3dly, to form from the blood the various secreted fluids, whether excrementitious, or for the purposes of the animal economy ; and, 4thly, to maintain the other assimilating processes, namely, those functions by which the healthy structure of every part of the body is preserved.

This part of the investigation, at the same time that it rendered evident what functions belong to the sensorial power, pointed out the manner in which that power exercises, in the more perfect animals, so necessary an influence on the nervous, and through it on the muscular power, that neither can long subsist without it.

Respecting the seat of the muscular power, there can be no question. The sensorial and nervous powers reside in the brain and spinal marrow, the nerves and their plexuses and ganglions being only the means of conveying and combining the influence of these organs. Both powers, as proved by direct experiment, reside in both of these organs. The former, however, in the more perfect animals, resides chiefly in the brain, the latter equally in the brain and spinal marrow. In their action, the brain and spinal marrow have no direct dependance on each other, each being capable of its functions when separated from the other.*

* The cause of the loss of voluntary power in the limbs, when the spinal marrow is divided, does not in any degree arise from the loss of power in the lower part of the spinal marrow, but from its separation, and consequently that of its nerves, from the chief organ of sensorial power. The will can no longer influence them, but their sensibility to stimuli applied either to their nerves, or those parts of the spinal marrow from which their nerves proceed, is unimpaired.

CHAP. I.

OF THE SYMPTOMS AND NATURE OF MALIGNANT CHOLERA.

KEEPING the foregoing positions in view, let us consider what are the necessary consequences of an injurious impression made on the nervous system, of so powerful a nature, as immediately to impair all its functions. The voluntary powers are, of course, enfeebled, and from the immediate influence of the nervous, on the whole of the muscular system, and consequently on the heart and blood-vessels, whose power depends on that system, the circulation languishes; this effect being greater or less, according to the force and suddenness of the impression made on the nervous system, and the liability of that system at the time, to suffer from the impression.

In proportion to the debilitating effect produced on the nervous system, the process by which the temperature of the body is supported fails. In the same proportion, the function of the various secreting surfaces is deranged, their proper fluids being no longer formed. The air cells and tubes of the lungs, for example, it is found, by direct experiment, become clogged with phlegm, in consequence of which the air can no longer effect the necessary change on the blood, so that it remains of the dark venous character, its colour gradually deepening, in proportion as the office of the lungs fails. It thus becomes incapable of evolving heat, even were the due nervous influence supplied. The temperature therefore fails from a double cause, a failure of the agent, by whose operation on the blood, heat is disengaged from it, and the blood being so changed, that it is no longer capable of evolving it.

The other assimilating processes also necessarily fail, so that the due structure of the vital organs is no longer preserved. The lungs in particular, from their structure, being

more evident than that of the other vital organs, when the cause is very powerful but not sufficient immediately to destroy life, are soon observed to lose their healthy structure. Their air cells and tubes, it has been found, by repeated experiments, are at length obliterated, and they assume in many parts a solid and fleshy appearance, still further preventing the change on the blood, effected by them in health, and consequently still farther causing the blood to deviate from the healthy state.

As these changes proceed, the breathing necessarily becomes oppressed and imperfect, the whole body cold, and from the accumulation of the blood in the more internal parts, which we shall find is also a necessary consequence of the sudden debility induced on the nervous system, the surface becomes shrunk, pale, and at length, from the deepening colour of the blood, dark coloured. The greater heat of internal than external parts of the body arises, of course, from their being less exposed to the cooling effect of the air, which is constantly impairing the temperature supported by the heat, disengaged from the blood by the action of the nerves on this fluid; but it is evident, that if on the one hand, either the nerves are no longer capable of this action, or on the other, the blood is no longer suited to it, the heat must cease to be evolved. Here both causes concur to extinguish this process, and the body cools on the same principle as that in which life is extinct, but the lungs more rapidly than in the dead body, because, while respiration continues, they are exposed to the cooling influence of the immediate contact of the external air, which is not the case in the dead body. Thus at length the expelled air is no longer heated, but remains of the temperature of the atmosphere, and from the moisture it imbibes from the lungs, feels even colder.

Are not the foregoing, which are the necessary effects of a loss of power in the nervous system, the leading symptoms of the more severe cases of malignant cholera? and do not

the symptoms with which this disease makes its attack, equally with those which follow it, prove the injurious impression to be made on that system ?

In considering the nature of the disease, we must keep in view the more severe cases, where the impression of the offending cause is less powerful, it necessarily acts more in the way of more ordinary causes of injury, and its effects are various, being influenced by the particular constitution of the patient and other occasional circumstances, which have no influence on the more powerful impression. Thus, in the former instance, fever, inflammatory affections or partial congestions arise. It is when its cause is so powerful as to set at defiance the influence of all other concurrent causes, that the disease assumes one uniform character, which unfolds its real nature.

The following I regard as the great peculiarity of this disease, when exquisitely formed, in which it differs from all other diseases with which we are acquainted ; I have been at much pains, both in my Inquiry into the Laws of the Vital Functions, and in a paper published in the Philosophical Transactions of 1829, to shew that except where death is occasioned by an extreme and sudden injury of the sensorial or nervous system, in which case all the powers of life are instantly extinguished, I say that these cases excepted, in all the modes of death with which we were acquainted, the sensorial functions are always the first which cease, but here these and the nervous functions, as in instantaneous death, cease together, the former only ceasing in consequence of the total failure of the functions of the nervous system. Hence it is that the mental powers remain to the last ; the cause of the disease making its impression on the nervous system alone, and the sensorial having no direct dependance on the nervous power.

Were it not that it would too much protract this part of the subject, I could offer a striking illustration of all that has been said, by comparing the results of the experiments

in which death was occasioned, by the influence of the nervous power being impaired throughout the whole system, with those caused by the division of particular nerves, which although of a similar nature, are necessarily partial.

When we find that the cause of malignant cholera, whatever be the nature of that cause, makes a sudden and injurious impression on the nervous system, as appears from the symptoms with which it makes its attack, that other severe injuries, wholly confined to the nervous system, produce precisely the same train of symptoms, and that such are the laws of the animal economy, that we might have easily foretold these effects, there can be little doubt of the nature of the disease. The different degrees of the disease and the symptoms of recovery, also confirm the foregoing view of its nature; it is in proportion as the nervous functions are still performed that the disease is mild, and the first symptoms of recovery are some appearance of the natural secretions, and some return of the natural warmth.

It will be necessary, however, in order to place the subject in the clearest point of view, more minutely to consider the various characteristic symptoms of the disease; and I shall begin with the symptom from which it very improperly takes its name, the discharge from the bowels which so frequently attends it.

It appears, from all the experiments I have made on the subject, that when the power of secreting surfaces is to a certain degree impaired by injury done to their nervous power, they pour out an increased quantity of fluids, but such as have not the due properties of the fluids prepared by them when their nervous power is entire. Thus, if the nerves of the eighth pair be divided but not displaced, under which circumstances it is found that digestion still goes on, though imperfectly, in consequence of a certain portion of the influence of the brain still passing from the one divided end of the nerves to the other, and that, although they may have retracted for a quarter of an inch from each other,

the discharge from the surface of the stomach is found much more copious than in health ; while on the other hand, if these nerves be divided, and one portion of the divided nerves folded back, or a considerable portion of them removed, so as wholly to prevent the influence of the brain being conveyed to the stomach, the contents of the stomach are found comparatively dry, and if the animal has lived for from fifteen to twenty hours after the operation, completely so, the secreting process have entirely ceased, and the food remaining wholly indigested. Thus it is that Dr. Barry and others remark, that in severe cases the diarrhœa is rather to be regarded as among the favourable than unfavourable symptoms. The discharge it is well known has none of the characters of bile, either pure or diluted, and comes from the surface of the bowels themselves, as its appearance and all the attending circumstances, as well as the experiments just referred to evince ; and is the consequence of their nervous power being to a great degree impaired, but not yet wholly destroyed. Some secretions fail from slighter causes than others. That of the kidneys is particularly apt to fail, and hence it is that in malignant cholera, this secretion generally fails at an early period, and the bladder being left empty, shrivels. On the same principles the skin is often wet with sweat, and some secretions, the bile, the saliva, the tears, &c. fail altogether.

The particular state of the breathing is one of the most remarkable features of the disease, and is intimately connected with all its most characteristic symptoms. The oppressed and imperfect breathing of malignant cholera bears no resemblance to the state of the breathing in an asthmatic paroxysm, which can only be induced by causes narrowing the passage of the air at the entrance into, or in the course of, the windpipe ; but is precisely of the same description with that produced by depriving the lungs of a considerable portion of their nervous power. Even the division of both of the eighth pair of nerves, and the dis-

placement of their divided ends, which deprives the lungs of nearly the whole influence of the brain, leaving to them little more than that of the spinal marrow, does not in general cause immediate difficulty of breathing, unless the laryngeal nerves be injured. This seems only to come on in proportion as the phlegm accumulates in the lungs, and the breathing becomes more imperfect and oppressed in proportion as change of structure takes place in them; for here we have seen the same change of structure take place in the lungs as in the malignant cholera, strikingly evincing the similarity of the two affections. Such being the state of the lungs, we are at no loss to explain the dark colour of the blood. The lungs are no longer capable of originating it, and could we by any artificial means, acting directly on the blood itself, produce this change in it, it is evident that it would, on the discontinuance of these means, immediately resume the black colour, unless we could at the same time restore the functions of the lungs, without which it is also evident that no essential step could be made towards the cure of the disease.

Although the black colour is the most evident change which takes place in the blood in cholera, it can only be one of the many changes in it which must necessarily obtain where all the secreting organs, whose office it is to form from it the various secreted fluids, and purge it of those parts which have become useless in the animal economy, are deranged, the effects of which are necessarily increased by the debility of the heart and blood vessels. From all these causes, we are at no loss to account for the dark thick and grumous state of the blood, the livid appearance of the surface, which often shews itself so early in this disease, and for the circulation being so impeded, that were the lungs healthy, the blood could not be duly originated.

Another striking feature of malignant cholera, which is no less than the preceding symptoms, the necessary consequence of the injurious impression made on the nervous

system, is the accumulation of the blood in the vessels of the vital organs, and consequently its remarkable recession from the surface, causing all the external parts to shrink as in the cold fit of an ague, but in a far greater degree. Hence the diminished size of the fingers, the hollowness of the eyes, &c. It appears at first view, sufficiently to explain this change in the distribution of the blood, that the weakened powers of circulation being incapable of carrying the blood to the surface, allows it to accumulate internally, and this no doubt has its effect; but on reviewing the subject with greater care, and comparing it with other well established facts, we find this cause altogether inadequate to the effects observed in malignant cholera, and another of far greater power operating here. In the most severe and long continued fainting, in which the powers of circulation are as much diminished as is consistent with life, we observe no analogous effect on the internal organs. To account for it we must again recur to the laws of the nervous system, and the particular state of that system, in the disease before us. It appears from a great variety of facts, that as the nervous system sympathizes more with the vessels of vital organs than with those of other parts of the system, the latter in the same proportion sympathize more with it. We find the vessels of the surface greatly deranged, without exciting much general disturbance of the system, but any derangement of the vessels of a vital part, unless it be of a chronic nature, arising by slow and imperceptible degrees, in which case the powers of the system are gradually accommodated to the change, is instantly felt through the whole. In like manner the affections of the nervous system are more immediately felt in the vessels of vital organs, than in those of less important parts. This position is illustrated at considerable length, in the 91st and following pages of my *Treatise on the Preservation of Health and the Prevention of organic Diseases*. It is thus that long continued irritation of the nervous system disposes to a certain species of

nervous apoplexy ; I have known, in an exhausted constitution, and most physicians who have been long in practice have seen similar cases, the face become suddenly pale and all power lost, the patient falling down insensible, and the countenance continuing to increase in paleness, till it assumed a cadaverous hue ; and yet this patient has been immediately restored to the use of his faculties, the paleness of his countenance at the same time abating, by the loss of blood ; and there is every reason to believe would have died without it. We know from the evidence of dessication, that in such cases the internal vessels from the debility induced on them, by the long continued irritation of the nervous system, suffer themselves, and that often very suddenly, to be morbidly distended by the force of the circulation, and thus to receive a greater than usual share of the blood sent to the head, the external vessels consequently receiving a smaller quantity. Hence the paleness of the countenance on the attack of this species of apoplexy, the increasing paleness as the blood accumulates in the internal vessels, owing to their increasing debility, and the restoration of the natural colour of the face on the sudden abstraction of blood, which allows the distended vessels to contract, and restore the due proportion of blood to the external vessels—phenomena, which appear at first view unaccountable, a free communication existing between the external and internal vessels, and which only admits of being explained by the greater sympathy with the nervous system, and consequently greater debility of the latter vessels. Here we have in one vital organ, the same accumulation of blood, though not to the same degree, and the same consequent want of it in the external vessels, as in malignant cholera.

Many similar facts might be adduced to prove that the vessels of vital organs are both more, and more, immediately affected by the states of the nervous system than those of more external parts. Hence it is, that in the malignant cholera, where so powerful a cause of injury is operating in that system,

the former are so suddenly, and to so great a degree debilitated, allowing such an accumulation of blood to take place in them, as leaves the surface pale and shrunk; and this effect is greatly increased in the disease before us, by the changes which have taken place in the blood itself. When the debility of the vessels is confined to one vital organ, and particularly where the lungs are still entire, the blood although impeded in that organ, is not essentially altered in its properties. As long as the debilitated vessels are capable of supporting any motion in it, it is still capable of stimulating them, although they are incapable of duly obeying the stimulus; while in cholera, at the same time that the power of all the vessels is impaired, the blood loses its healthy properties. If the vessels were healthy, the blood is no longer capable of exciting their healthy action. Thus a double cause is here operating to produce the accumulations observed, and thus it is that the various causes which have been enumerated, the changes which take place in the lungs, the failure of power in all the secreting surfaces, the greater debility of the vessels of the vital organs, the accumulation and stagnation of the blood in them, and even the changes which take place in the blood itself, all conspire to produce the diseased state which so rapidly takes place in that fluid in malignant cholera; and among its other changes, the intense dark colour, which small as the quantity of blood in the superficial vessels is, gives to the surface the colour that characterizes the worst cases of the disease.

It is impossible to conceive a more powerful concurrence of causes tending to destroy all the vital powers of the constitution than meet in extreme cases of this disease. By the sudden and injurious impression made on the nervous system, all its own functions, as well as those of the heart and blood vessels, are debilitated. The whole secreting system is deranged, so that the blood is neither duly oxygenated in the lungs, nor purged by the secreting surfaces; while from the greater sympathy with the nervous system of the internal than ex-

ternal vessels, the former being most debilitated, necessarily yield most to the force of circulation which still remains, giving rise to morbid accumulations in the organs of life, which tend at once still farther both to impair their functions and vitiate the blood. Thus we are at no loss to explain either the leading symptoms, or the rapidly fatal tendency of the more severe cases.

The nature of some of the less essential symptoms still remains to be considered: among these the most striking is the spasmodic affection of the muscles of voluntary motion. All causes tending to debilitate these muscles, inanition, fatigue, &c. dispose them to spasm, particularly when, at the same time, causes of permanent irritation exist in the source from which their nerves arise. We know from the laws of the animal economy, that the shock given to the nervous system tends to debilitate these as well as the muscles of involuntary motion, and we could easily have foretold that they would become subject to spasm in such a disease. The vomiting and hiccup we can be at no loss to account for, where the secretions of the stomach, and consequently whatever else it may contain, are so much disordered. It is observed by Dr. Barry and others, that in the more severe cases, these have rather been found favourable than unfavourable symptoms. They are not among the symptoms of the most extreme states of the disease, the cause of which is also readily understood. These symptoms depend on the nervous sympathy which exists between the surface of the stomach and the muscles which are called into action in vomiting and hiccup; but in extreme cases, the function of conveying the impression to the muscles in question, as well as the other functions of that system is lost, and the muscular coat of the stomach itself is no longer capable of the act by which its contents may be regurgitated without the act of vomiting, and which, in vomiting, I believe always, although the contrary has been maintained, accompanies that act in a healthy subject. The contents of the stomach in such cases, therefore, remain as in the stomachs of those already dead.

One of the most remarkable features of cholera is, that however severe the symptoms, the sensorial powers are generally entire to the last. We know that the organs of the sensorial and nervous powers, although both residing in the brain and spinal marrow, are distinct organs, because in man, and the other more perfect animals, the sensorial power is chiefly confined to the brain, while the nervous power belongs equally to both brain and spinal marrow, and because, in the investigations above referred to, it was shewn that all the functions of the nervous power may, for a certain time, remain after the sensorial power is wholly withdrawn. Now, it appears from the symptoms of malignant cholera, that the cause of this disease makes its attack on the organs of the nervous power alone, and hence it is, that the sensorial power, on which the nervous power has no direct influence, often remains unimpaired to the last.

There is no peculiarity of cholera of more importance in a practical point of view than the inflammatory tendency of the vital organs which so constantly attends it, except in the most severe and rapid cases. It will be necessary to consider this tendency at some length, to point out its connexion with the more essential symptoms of the disease, and the circumstances under which it is most apt to prevail.

I have had occasion, in considering the cause of the morbid distension of the vessels of vital organs in malignant cholera, to point out their greater sympathy with the nervous system than that of the vessels of less important parts.

It is now farther to be observed, that it is in the extreme parts of the nervous and circulating systems that these systems are most intimately connected. It is in the most minute branches of both that the changes on which the various functions of life depend take place, and consequently that the greatest sympathy exists between them. Hence it is that the affections of the nervous system so greatly influence the functions of secreting surfaces, of which we see many proofs, in the manner in which states of mind influence

the secretions of the bowels, kidneys, &c. In the act of blushing and other phenomena also, we see the immediate power of the nervous system over the minute vessels. Thus of the vessels of vital organs the most minute, or, as they are termed, capillary vessels, are those most influenced by the nervous system; and hence it is that in malignant cholera, we often find from dissection, an almost universal tendency to inflammation in those organs.

I had occasion to make many experiments, an account of which the reader will find in the introduction to the fourth edition of my Treatise on Symptomatic Fevers, from which it appears that the immediate cause of inflammation is a loss of power in the capillary vessels of the part, in consequence of which they suffer themselves to be morbidly distended by the force of the circulation, the immediate effect of which is, that the heart and larger vessels are, through the medium of the nervous system, excited to increased action, for the purpose of supporting the motion of the blood in the debilitated capillaries. It is thus that, except in those cases where the cause of the disease is so powerful, as at an early period to subdue the whole circulating powers, some degree of re-action is observed, when the morbid distension of the capillaries of the vital organs is established.

It appears, from the whole of the facts which have been laid before the reader, that when a sudden and powerfully debilitating cause acts on the nervous system, it immediately impairs the whole powers of circulation, and particularly the vessels of vital organs, and of these the capillaries more than the larger vessels.

When, however, the cause is extreme, the power of all the vessels of the part are so debilitated, that the larger vessels are incapable of propelling the blood into the debilitated capillaries with such force as to distend them; in consequence of which the blood accumulates in the larger vessels themselves, and a state of congestion, which has little or no tendency to excite re-action, rather than inflammation of these organs takes place.

In my *Treatise on the Preservation of Health, and particularly the Prevention of Organic Diseases*, I have been at much pains to point out the distinction both in the nature and symptoms of congestion and inflammation, that is, a morbid distension of the larger or of the capillary vessels of the part. The latter appears with active and decisive symptoms, because the failure is in those vessels which immediately co-operate with the nervous power in all the functions of the system; the former, with those of a less active nature, because the failure is only in the vessels which convey the fluids to the capillaries, which, if they retain their power, are more or less capable of their function, as long as the remaining power of the larger vessels is capable of supplying to them any portion of blood.

According as the state of malignant cholera inclines to produce distension of the whole vessels of the part, the symptoms of extreme debility and a general failure of the powers of life prevail. As it tends to produce distension of the capillaries only, with which the nervous system most sympathizes, a tendency to symptoms of re-action appears.

It often happens, however, both from the increasing debility, and because the debility of the capillaries always tends, for reasons pointed out in the treatise last referred to, to produce debility, and consequently distension of the larger vessels of the part, which of course the more readily happens,* the greater the tendency to general debility of the circulating powers; I say it often happens for these reasons, except in extreme cases, that the greatest degree of sinking of the powers of life comes on after the disease has lasted some time. The re-action caused by the inflammatory

* When with the aid of the microscope we watch the progress of inflammation, we find it commence with debility, and consequent distension in the most minute vessels of the part, which gradually extends to those of a larger size. This extension of the debility, of course, will be most rapid and to the greatest degree, where the vessels are most debilitated.

tendency for a little recalls the powers of the constitution, which again gradually sink as the distension of the capillaries extends to the larger vessels of the part. The reader will at once see that the case, except under very peculiar circumstances, is then hopeless ; because the vessels whose excitement ought to recall that of the capillaries, have themselves partaken of their debility. Hence it is that those who have practised in malignant cholera remark, that from this second sinking they saw no recovery. Thus it is not unusual for some degree of re-action in malignant cholera to be followed by those symptoms which indicate the more formidable failure of all the powers of life. The tendency to inflammation or congestion in this disease more than any other circumstance we shall find, regulates its treatment.

CHAP. II.

OF THE CAUSES OF MALIGNANT CHOLERA, AND THE MEANS
OF PREVENTION.

I HAVE no intention of entering at length into the disputed question of the contagious, or non-contagious nature of malignant cholera, but any man who, without prepossession, compares the history of the disease with the way in which it often spreads in families, and the circumstance of many who had made up their minds to its non-contagious nature, having been converted to the opposite opinion by their own observation of the disease, will not, I think, long hesitate which side to adopt. It is to be recollected, that here one positive is worth many negative facts. The most contagious disease is not always communicated. Some are incapable of receiving the infection. This is even the case respecting small pox, measles, &c. Others are little disposed to it, and much less at one time than another. Various other circumstances, some of which it is difficult to trace, influence the propagation of contagious diseases. The most decided typhus has sometimes shewn no tendency to spread. "Sometimes," Dr. Lind observes, "one man may be seized with the petechial or with the yellow fever, while the rest continue unaffected."

Independently of all other considerations, the circumstance of malignant cholera being a new disease, for it will now, I believe, be admitted that the attempts to prove its identity with any disease formerly known have failed, is sufficient perhaps to determine the question *. Whence

* In the history of medicine we observe contagious diseases which had long prevailed suddenly disappearing, and others arising in their stead. But the facts preserved, concerning the production and disappearance of these diseases, throw no light on the sources from which they arose. The leprosy of the Jews, and other species of leprosy which raged in Europe in the 12th and 13th centuries, are scarcely now to be met with. We have a remarkable instance both of the production and disappearance of a contagious disease in the *Ephmera Britannica*, or, as

arises a new disease? Must it not be from a combination of causes of very rare occurrence? and how is such a disease to be propagated, if not by some cause arising from itself? It is not very unusual to see in particular instances a disease to which the best informed cannot give a name, but unless it prove contagious, we see no more of it. We cannot suppose that a combination of causes, hitherto unknown, should all at once become a frequent occurrence. That the malignant cholera is at least, under many circumstances, contagious, is surely, from all the facts before us, the most logical, and it is evidently the safest conclusion.

The precaution which first suggests itself, therefore, and probably the most important, is to avoid those labouring under the disease, and whatever has been in contact with or near them. There are so many channels, however, through which a subtle contagion may be conveyed, that it is difficult to confine it. It is therefore of great importance to do what we can, both to lessen the activity of the contagion, and fortify the habit against it.

The most virulent contagion becomes innocent when sufficiently diffused; were not this the case there would be no limits to its power. A free ventilation, therefore, has always been found one of the best means of prevention. That contagion becomes more active by confinement we have ample proof. It has long been an opinion, Von Swiete,

it was termed, the *Sudor Anglicus*, described by Caius* and others. The gangrenous sore throat, Allionius† observes, was scarcely known before 1610, since which time it has made dreadful havoc in almost every country of Enrope. The *Plica Polonica* seems to have made its appearance only in the 17th century. The address of the Polish physicians to the University of Paris is still extant, in which the disease is described as new, extremely contagious, and incurable by any means they could think of. Whether the malignant cholera will, like the *sudor anglicus*, disappear, or continue to recur, like the gangrenous sore throat, we cannot tell. We have reason to fear the latter, because the more extensively a contagious disease has raged, there is the greater chance of its contagion lurking somewhere to break out on a future occasion, the only conceivable cause of a contagious disease finally disappearing being the final extinction or sufficiently extensive dissipation of its contagion.

* Caius de *Ephemera Britannica*.

† Allionius de *Miliarium Otigine*.

Pringle, Cullen, Lind, Mead, and others maintained it, that even its retention in substances impregnated with it increases its virulence.

A remarkable feature in the malignant cholera, as in almost all other contagious diseases, is that it seems, to use the common expression, to wear itself out after it has existed a certain time in any particular place. It is now abating in Sunderland, but rapidly increasing in Newcastle. There is no fact better ascertained than that the body acquires the power of resisting the effect of contagion by frequent exposure to it. Hence the greater safety of physicians and nurses, and the greater risk of strangers coming to infected houses. Now, although a certain degree of diffusion renders contagion innocent, we cannot say what degree of it is necessary to prevent its still affecting the predisposed. Those who are very much so may feel its effects, even when extremely diluted, so that the air of a neighbourhood may become sufficiently impregnated to affect them. But they, like others, will become more capable of resisting it by continued exposure to it, and thus after the most predisposed have suffered from it, the rest may be enabled to resist it. Its power may in this way decline in places where it has long existed, but appear with renewed power in others, to which it happens to be conveyed.

Several circumstances respecting its mode of spreading seem to sanction this opinion. Amongst others, it accounts for those in the same quarter of the town taking the disease, although they have not been near the sick, while the inhabitants of more distant parts escape it, the contagion being too much diluted even to affect the most predisposed before it reaches them. It would also account for many of the facts which have given rise to the disputes respecting its contagious or non-contagious nature. The greatly predisposed at a considerable distance, may be more liable to infection than the less predisposed nearer its source, and thus intercourse with the infected may appear to have no tendency to produce the disease. It has long been a maxim with physi-

cians, that although contagion may be conveyed by the air or other substances in motion, it only, independently of such modes of conveyance, extends a few feet, or at most yards, from the infected. But different contagions probably require different degrees of dilution to render them innocent to the predisposed, and the spreading of some may depend more on predisposition than that of others.

If these suggestions are confirmed, they will account for the tract the malignant cholera has pursued, without appearing so contagious as many diseases which spread less extensively, and for the insufficiency of cordons and other means employed for checking its progress; and could we ascertain what distance renders the contagion innocent even to the most predisposed, some additional precautions might be adopted to check the progress of this and similar diseases. Individuals, favourably circumstanced, would have it more in their power to avoid infection. The foregoing considerations place in a striking point of view the importance of all means which tend to correct the predisposition to infection.

Various attempts have been made to destroy contagion. Fumigation with different substances, has more or less of this effect. Of these the mineral acids are the most powerful. The most infected jails and ships have been purified by fumigation with the muriatic or nitrous acid, but so efficacious a fumigation is accompanied with too many inconveniences to be adopted on ordinary occasions.

Most other means influencing the progress of contagious diseases, operate by rendering the body more or less liable to its action. Much has been said of various nostrums as preventives, which in general are productive of no other advantage than the confidence they inspire. Some medicines, however, particularly aromatics, and what are called tonic medicines, provided they agree with the habit of body, seem to possess a certain degree of preventive power.

We can have little doubt, that whatever may be the case

with respect to other contagions, that of malignant cholera makes its attack on the nervous system, and that it is through this system that all other parts are influenced by it. If it has been found in the case of other contagious diseases, and we have only to appeal to universal experience for the proof of it, that whatever debilitates this system, disposes to, and whatever tends to strengthen and confirm it, protects against infection, this cannot fail to be the case with respect to it. Accordingly, we find it stated in all the accounts of it, that every cause, whether mental or bodily, which depresses the powers of that system, disposes to its attacks; the depressing, or the debilitating effects of the exciting passions, a poor and very scanty diet, or excess either in eating or drinking, a hot and close, or a cold and damp atmosphere, fatigue, long continued watching, debility from disease, old age, &c., in short all causes deranging the nervous system.

It would even appear, that so slight a cause affecting it, as a fetid smell disposes to infection. Diemerbroeck mentions several cases, which seem to prove that the smell of the coarsest kinds of soap disposed to the infection of the plague, and it is probable that filthy and confined situations act in this way, as well as by adding to the power of the contagion. On the other hand, it has often been remarked, that those employed in store houses of spices are little subject to infection. The same effect has been ascribed to the odour of tar, but nothing of this kind can be relied on.

The most effectual of this class of means are those, different in different circumstances, that best preserve the health and vigour both of mind and body. Even sleep, in which the vigour of the vital powers is less than in our waking hours, has been found to dispose to infection. A vigorous body, and an easy mind, are the best personal protectives when contagious diseases rage, and this was never more strikingly exemplified than in the case of that which now assails us. The diseased, the weak, and the

desponding, are more than usually selected by it. We ought not, however, by such observations, to be betrayed into too free a use of invigorating means. When carried beyond the proper line, they become indirect causes of debility. The system cannot always be kept, even in the slightest degree, above the healthy tone. Hippocrates justly observes, in his third Aphorism, that the extreme of health is dangerous, a maxim, when fully understood, conveying many important cautions.

The most secure health is not to be obtained by any one set of means, but by a uniform attention to a great many, which taken individually, appear of little importance. I shall here present to the reader a review of them, taken from my Treatise on the Preservation of Health. For the healthy and the vigorous, it is only necessary to avoid excess and much irregularity in their habits; but there is no particular of what I am about to say, that does not deserve the careful attention of those of a more delicate frame, and consequently a more sickly tendency, whether natural or acquired. The following observations relate only to the daily occurrences connected with our state of health, which are powerful only because they are of daily occurrence; the first part, to diet; the second, to exercise and sleep.

MEAT, provided the skin and much fat be avoided, and stale bread, are both the most easy of digestion, and the most nutritious articles of diet, although to certain stomachs bread is oppressive. That, in general, is the lightest which is best risen and soonest becomes dry. Mutton is the lightest meat, and the oily and mucilaginous meats the least so. Fish is both more difficult of digestion, and less nutritious than the flesh of land animals,

Unless there be some particular reason to forbid it, there is no objection to animal food twice in the day, but it should not be taken later than three o'clock. The stomach generally requires about six hours to digest an ordinary meal.

This time, therefore, if the feelings of the patient will allow him to fast so long, should be allowed after each meal ; some degree of hunger is a wholesome stimulus to the stomach, but a long continuance of it is injurious.

Some require a longer time, and others digest more rapidly than is usual. The latter I believe happens less frequently than is supposed. Feelings of debility prompt the patient to eat too soon. If the food is not taken with relish, it is never well digested ; and if one meal be taken before the digestion of the former is completed, the stomach soon becomes oppressed.

Mastication is the first process of digestion, and when the food is not well divided and well mixed with the saliva, its other processes are never well performed by a weak stomach.

Proper mastication has the additional advantage of putting the food slowly on the stomach. The appetite, which arises from the effect of the gastric juice on the stomach itself, continues while there is any disengaged gastric juice, and when the powers of this juice are weakened, it requires a longer time to combine with the food ; if the dyspeptic, therefore, eat as fast as those in health, some part of this juice remains disengaged, till, from the consequent continuance of the appetite, the patient has put more on his stomach than it can digest.

In those of weak stomachs, indeed, the gastric juice often does not flow freely till the stomach is stimulated by the food. Hence, it is common with them for the appetite to increase while they eat ; and if the irritating remains of a former ill-digested meal continue on the stomach, it often excites a sensation, which being confounded with the feelings of hunger increases it, and makes the patient think he never has had enough, and thus the evil is still increased.

For all these reasons the dyspeptic should be careful to masticate his food well, and put it slowly on the stomach. He should particularly take care not to eat too much. Different constitutions require very different quantities of

food. I have found it the best rule for the patient to leave off with such an appetite that about one-third more could be taken with pleasure; and although the appetite is not satisfied at the moment, in ten minutes or a quarter of an hour it will be so; that is, when time is given for the whole of the gastric juice to combine with the food.

This rule, for reasons just given, may sometimes deceive; but its errors may be very effectually corrected by the patient's observing whether any sense of oppression succeeds the meal, which will not fail to ensue if any of the food remains undigested.

Nothing in the diet of the dyspeptic is of greater consequence than making it simple. When we eat of a variety of dishes every new dish excites a fresh appetite, and it is impossible for us to judge when such a quantity as the stomach can digest is taken; and in this way injury would arise, although all the articles were of equally easy digestion.

Thus, although no general rule can be laid down, each may ascertain the quantity which suits his own stomach, a point of essential consequence; because any part of the food remaining undigested, is nothing less than a cause which, if frequently repeated, must necessarily baffle the means of cure.

All hard animal substances are of difficult digestion; and all oily, stringy, and membranous substances, whether animal or vegetable; the fat of bacon, toasted like bread before the fire, that the flame may not render it empyreumatic, in some patients, being the only exception I know.

All fruits and fresh vegetables, and whatever else is inclined to ferment; all the fermented liquors of this country, for example, with the exception of distilled spirits, which are in another way the most pernicious of all, are usually oppressive to a weak stomach. Of vegetables a mealy potatoe is, to most stomachs, the best; and peas, beans, and cabbage, the worst.

Of fermented liquors, foreign wine is the only one which, in moderate quantity, appears to be innocent. Different kinds agree best with different stomachs. When French wines agree well with the stomach they are the best, particularly claret; but the Spanish wines more generally suit a weak stomach; and when even these cannot be used, and the habits of the patient render some fermented liquor necessary, a little distilled spirits may be substituted; and then the less the quantity, and the more diluted, the state of the stomach and general health admit of, the better.

A liquid diet, whatever be the nature of the liquid, is unfavourable to digestion in a weak stomach. The gastric juice of such a stomach, already too feeble, will not bear much dilution. The contents of the stomach, however, may be too dry for their necessary motions; of this we have no measure but the thirst, and the comparative quantity of liquid which the patient takes: but liquids are often rapidly absorbed from the stomach; and in the thirst, as in the appetite of the dyspeptic, there is often a fallacy, and for a similar reason. The best rule is for the patient to drink when thirsty, but not copious draughts, a few mouthfuls will often quench the thirst, and when not thirsty to abstain from drinking altogether.

With the exception of a moderate use of wine proportioned to his habits, for habit alone renders any necessary except when given as a medicine, I say with this exception his drink should be water. It may be mixed with the wine, or taken alone, as he pleases. If the wine is taken undiluted, it should be taken after, not during dinner, as at this time it is an additional excitement to overload the stomach. A moderate quantity of wine seems to be innocent to those whose stomachs and constitutions agree with it: they who take it enjoy as good health and live as long as others.

Peculiarities of constitution occasionally interfere with every rule; as far as these exist, the patient must be allowed to judge for himself. The object in view is a diet that is

light and easy of digestion; and if he is in earnest, he will very soon, with the assistance of the foregoing observations, find out that which suits him.

It appears from what has been said, that in general, three meals in the day is the best number, the last always being a light one. After the irritations of the day, even the healthy are less fitted for irritating food, and the delicate are much hurt by it. Some, of quicker digestion than usual, or more debilitated and consequently less fitted to receive the necessary quantity, or abstain the proper time, require four meals.

4 It is of great consequence to observe regularity in meals. All the functions of the system are best performed at stated periods. A thousand circumstances prove that such is the nature of our constitutions.

THE importance of regularity is equally remarkable in the regulation of exercise and sleep. The early part of the day is the proper time for all the more powerful exertions of both mind and body. Towards night the various impressions of the day have produced their effects, and the languor which succeeds all kinds of excitement is sensibly felt by the invalid. Repose is then more necessary, and exertion of every kind more apt to be injurious.

In health, there is often some increased excitement of pulse in the evening. In the invalid it frequently amounts to a degree of feverishness, and is the cause of stimulating food being particularly injurious to him at this time. This state is only effectually relieved by the most perfect repose, healthy sleep. Those are mistaken who imagine the period of the day allotted to exercise and to sleep immaterial, provided the proper length of time be spent in both; there is a diurnal revolution in the animal, which corresponds to that of the natural world.

We are active and vigorous in the fresh air and rising dews of the morning, and more or less worn and relaxed in the vapid air and falling dews of the evening. The healthy

do not sensibly feel each deviation, but there is a sensible difference even in the appearance of those who habitually keep good or bad hours, although the latter may spend more time both in exercise and sleep.

The languor of the evening in the invalid is not wholly the consequence of the exertions of the day. The evening air has always been found unfavourable to him, and in some countries it is very sensibly so to the most healthy. The peculiar freshness of the morning air is given by the contact of the cold and moist surfaces of the night; the flatness of the evening air, by that of the dry and heated surfaces of the day. Every one has felt the refreshing effects of a sudden shower after a sultry day. The evening and morning air is generally, more or less, the air before and after the shower.

The luxurious neither experience the exhilarating effects of the morning air, nor the calmness of the evening repose which nature dictates. Thus, as in all other instances, if we deviate from her laws, we only lose on the one hand as we gain on the other; and I believe, if the balance could be fairly struck, it would always be found in favour of her votaries. It requires much reflection to see all the consequences of any deviation from her dictates. One effect produces another, and the tone of both mind and body are influenced by many circumstances which, viewed barely in their immediate effects, appear of little moment.

This maxim is strikingly and often most painfully exemplified in the progress of diseases. In all obstinate diseases, however slight, we must watch carefully the state of those organs with which the seat of the present disease sympathizes. In common bilious complaints for example, the state of the head and lungs must be constantly kept in view, and that of the bowels often demands particular attention.

The last are little subject to organic disease; but the habitual irritation of their extensive and highly sensible

surface, in combination with the irritation of the original disease, preys on the constitution. I have seen in an old bilious case, in which there had for many years been an unusual degree of irritation in them, the patient, on taking cold, notwithstanding an advanced period of life and her family not being consumptive, fall into rapid pulmonary consumption; and her friends with surprise saw her sink in a few weeks under a disease to which they had never supposed her liable. She had been subject to what is called a bilious cough, but it was only temporary, and evidently arose from disordered stomach. By it, however, the lungs were prepared to suffer, and the long continued irritation of the whole system, by the frequent recurrence of the bowel complaint, had impaired the vigour of all its organs.

Such a case is full of instruction to the reflecting physician, and gives us many lessons in the prevention of organic disease. Habitual disease is like the dropping of water on the stone; every drop does something, although its effect cannot be perceived. This in the animal system, is what crime is in the moral; its effects extend in a thousand ramifications, and neither its limits nor its tendencies can be calculated. The functions both of mind and body are influenced; and who can number their functions, or trace all the effects of the changes in any one?

The animal system is a whole; one part cannot be disturbed without more or less influencing every other. In the case just mentioned, the friends of the invalid could make no estimate of the cause which had every where gradually weakened the powers of life, and, from the peculiar sympathies of the constitution, the lungs in particular*. They could only wonder that a person, none of whose relations had been consumptive, who in their opinion had never shown any tendency of the kind, should die of a more rapid decline

* It is shewn in a previous part of the Treatise from which this extract is taken, that the lungs particularly sympathize with the liver, and the heart with the stomach.

than is usual in the most predisposed ; and yet, with the proper clue, the effect appears only the consequence of the most common laws of our frame.

Almost all the unexpected occurrences of disease may be traced to the sympathies which are constantly operating,—which have obtained too little attention ; and which, the more refinement increases our sensibilities, operate with the greater force.

In proportion as the vigour of each part is entire, it is independent of others ; in proportion as it is enfeebled, it falls under their influence. If the hardy savage produces morbid distension of the stomach by an excessive meal, he neither complains of headache nor is harassed by cough. With more time the stomach can do its own work, without disturbing its neighbours, and they are too much at ease to be easily disturbed. But when a thousand anxieties and irritations, with which he is unacquainted, have given to every nerve what may almost be called a morbid sensibility, depending on the same law by which the gums, naturally of little feeling, become acutely sensible from the long irritation of a carious tooth, each part feels the state of every other, and a door is opened to a thousand ailments. The complicated feelings of civilized life, while they sharpen the mind, enfeeble the body ; as, in the pleasures of the luxurious, if we gain in one way we lose in another.

CHAP. III.

OF THE TREATMENT OF MALIGNANT CHOLERA.

THE object of the present chapter is so to apply the principles which have been laid before the reader in the first chapter, as to establish correct indications of cure in the various forms of the disease. It appears from what has been said, that nothing so much influences the state and progress of malignant cholera as the tendency to congestion or inflammation. We have seen why the former tendency prevails in the more, the latter in the less severe cases. The symptoms of debility, it appears, from what has been said, are proportioned to the tendency to congestion, that is to distention in the larger vessels, of the vital organs; those of excitement, or what has been called re-action, to the tendency to distention of their capillary vessels alone, namely, to inflammation of these organs.

The modes of treatment suited to these cases, when they are in the extreme, are in direct opposition to each other. In the one, our object is to rouse the oppressed powers of the system; in the other, to restrain the increased excitement. Most cases lie between these extremes. It is only in the very worst cases that no tendency to excitement, soon or later, shows itself, which renders a continuance of at least the more powerfully stimulating means injurious; and on the other hand, it hardly ever happens in this disease that the excitement runs so high as not to make great caution requisite with respect to the means of allaying it.

The circumstance, which next to the tendency to congestion or inflammation, most influences the practice in malignant cholera, is the tendency to local affections. In the cases, in which the cause is not sufficiently powerful at once to reduce all the vital organs to a state of extreme debility, those, which from peculiarity of constitution or

other causes are weaker than the rest, most feel the cause of injury, and in them both inflammation and congestion are most apt to arise, and local means of treatment directed to them form an essential part of the practice.

Again, when the patient has struggled through the disease, properly so called, the irritation which the system has undergone, like all other causes of great irritation, often proves a cause of fever, which here comes on under unfavourable circumstances, in a constitution exhausted by the previous disease. The treatment is now the same as in fever arising from similar causes and under similar circumstances, and is only influenced by the preceding disease, as far as the debility it has induced influences it. The treatment of malignant cholera, therefore, arranges itself under four heads.

1st. That of the most severe cases, where the cause of injury is so powerful as equally to affect the parts which least, and those which most sympathize with the nervous system, and obscure the effect of all other causes, either constitutional or accidental. The impression made on the nervous system, from the extent of its power, equally influencing the strong and weak parts of the habit, and equally prevailing over the most favourable and unfavourable circumstances in which the patient happens to be placed, the effects of all those causes which so generally modify the course of disease are wholly superseded. It resembles the blow which crushes the brain—the power of every part, whether more or less inclined to suffer, or more or less exposed to its effects, equally yielding to the impression.

2dly. That of the cases in which the offending cause being less powerful, affects most those parts which most sympathize with the states of the nervous system, on which it makes its impression. Here, for reasons above pointed out, the capillary vessels are most debilitated, and after the effects of the first shock given to that system, which is analogous to

the cold stage of fever, or the first stage of what surgeons call concussion of the brain, the powers of life more or less revive, and then the debilitated capillaries suffer themselves to be morbidly distended by the increasing force of the circulation. As soon as this happens, from the intimate connection and consequent sympathy which exists between these vessels and the nervous system, all the powers of circulation are through that system farther excited, and an inflammatory state of the habit is established; that is, the heart and large vessels are excited for the purpose of supporting the circulation in the debilitated capillaries, as happens in all severe cases of inflammation.

3rdly. That of the cases in which the state just described obtains, but the capillaries of certain parts, either from peculiarity of constitution or the operation of accidental causes, are most debilitated, and consequently suffer themselves to be most distended; in which case the blood flows most to them, which more or less relieves those of other parts, and thus the re-action is attended with symptoms indicating local affections. But whether the general excitement of the powers of circulation arises from a general distension of the capillaries of the vital organs, or those of particular organs, it tends for the time to restore the functions of the nervous system, and therefore to relieve the characteristic symptoms of the disease.

4thly. That of the cases which may rather be regarded as the consequence of the disease than as forming any part of it. The patient in his struggle with it has escaped, but suffers the common effect of all powerful causes of irritation. Fever ensues, which must run its course under the very unfavourable circumstances of a habit shaken by a severe previous disease. I shall make such general observations as the nature of the present treatise admits of, on the treatment of each of these states.

IN the first, there are but two indications of cure, namely, to excite the debilitated functions of the nervous system,

and to promote a due distribution of the blood, by recalling it to the surface, and thus relieving the congestion of the vital organs. If the patient is seen by the physician before the state of collapse becomes considerable, a moderate abstraction of blood for the purpose of relieving the debilitated powers of circulation, is proper, if nothing unusual counter-indicates it. After this state is more completely formed, were the blood capable of flowing, which it very soon ceases to be, blood-letting would be attended with the same effects as in the first stage of concussion of the brain, a state which resembles it in all respects, except in the material circumstance that in the case of concussion, the offending cause is no longer applied, and consequently, if the instantaneous mischief has not produced a fatal effect, the powers of the constitution have a better opportunity of rallying than where, as in the disease before us, the cause still continues to operate, the only change being, that, as in all similar cases, the system feels less its continued operation, than its first impression; for even in such extreme cases, the power of the system to accommodate itself to the circumstances in which it is placed, is not wholly unfelt.

For the means best suited to effect the objects we here have in view, we must appeal to the known effects of our various means of cure, and to the experience of those who have witnessed their effects in this disease. The warm air bath and other means of applying dry heat to the surface, frictions as far as they can be borne, and the operation of an emetic,* are the chief direct means of recalling the blood to the surface; but every means, whether external or internal, which rouses the energies of the nervous system, as appears from what has been said, must tend to this effect; particularly warm and stimulating drinks, warm spiced wine, or spirits, more or less diluted or even undiluted, according to the circumstances of the case, opiates, and the more powerful of what are called nervous medicines. Camphor, with or

* Drs. Russell and Barry recommend for this purpose two tablespoons full of common salt.

without vinegar, is much praised by Drs. Russell and Barry, by others ammonia, the essential oils, &c. opiates, all agree should only be employed in very moderate doses. The object is to secure their stimulant and avoid their sedative effect. It is not my intention, however, to enter on the more minute details; my aim is to point out the principles of the treatment, a knowledge of which is acquired by comparing with the known laws of the animal economy, the detail both of the symptoms and treatment given by those who have observed the disease, and watched the effects of the various means employed.

In employing all such means as those just enumerated, we must recollect that if they be carried beyond a certain limit, their immediate effects will be more than compensated by the increased depression which succeeds the operation of all powerful stimulants. The safest rule is to be satisfied with moderate degrees of excitement. It is sufficient that we avert the fatal sinking: for this purpose different degrees of power in the means employed will be requisite, according as the cause of injury is more or less powerful, and the patient's habit more or less excitable.

The effects of internal stimulants are often essentially aided by those whose operation is external. I have just had occasion to mention external heat, in the case before us, the most essential perhaps, as well as the safest, of all stimulants, and friction. It seems often to have added to their good effects to combine with them stimulant embrocations, particularly in the neighbourhood of those organs which most sympathize with the nervous system. They should be applied to the region of the stomach and liver, and the abdomen generally.

Powerful means of this description in the neighbourhood of the sources of the nervous power itself, promise still more important effects. There is reason to believe that irritants applied to the lower part of the back of the head, and particularly where it joins the spine, and along the spine itself, will be found among the most important parts of the treat-

ment. Near these parts lie the origins of all the vital nerves, where the failure of power evidently exists. In the report of Dr. Barry's excellent address to the medical men of Newcastle, it is stated, " Dr. Barry alluded to the treatment " which had been pursued by Dr. Lange, at Cronstadt. That " physician proceeded on the supposition that the cerebellum " and the spinal cord were the primary seats of the disease, " they having been found to be partially inflamed, and " thereby affecting nerves issuing from those parts. He " applied in fourteen cases a hot iron to the side of the " spine, and only lost two out of the fourteen ;" and Drs. Russell and Barry, in their late report, again refer to these cases. In the less severe, and consequently more protracted cases, other means, less violent than the actual cautery, and which may be used with more freedom, may be found preferable. It should be the object, as I have just had occasion to observe, to make such applications as near as possible to the origins of the vital nerves ; but as we approach the lower end of the spine, the nerves become less influential on the powers of life. From the part of the head above pointed out, to what is called the small of the back, we have reason to believe irritants will be found most effectual ; and when it is recollected that the heart and blood vessels obey stimulants applied to every part of the brain, from its base to its very uppermost surface, as appears from many experiments detailed in the Inquiry into the Laws of the Vital Functions so often referred to, and in two papers in the Philosophical Transactions of 1815, we have reason to believe that the extension of irritants to the whole of the scalp, in the more urgent cases, will prove an important addition to our means.

It was found by many experiments detailed in that Inquiry and in papers in the Philosophical Transactions of 1822—27—28, and 29, that galvanism is capable of perfectly restoring the power of vital organs after it has been wholly destroyed, by dividing their nerves and separating the divided ends. Galvanism, therefore, appears at first view,

from what has been said of the nature of malignant cholera, a means admirably adapted to this disease, and in the only case in which we have any account of its having been employed in it—a case in the island of Ceylon, treated by Mr. Finlayson, it is said to have proved beneficial, although it was only directed through the lungs. It surely deserves a trial, and it seems surprising that the trial has not sooner been made.

I cannot however overlook two circumstances, which serve in some degree to render the expectations from it less sanguine. That when the nervous power is merely withdrawn, it can supply its place, rendering the functions of the organ as perfect as while that power is entire, has been ascertained; but in the disease before us we have reason to fear that the failure does not consist in the mere loss of nervous power, but that the operation of the poison on the organs of that power diffuses the influence of the poison itself throughout the system. How far this is the case, we cannot in the present state of our knowledge tell; but be this as it may, it may easily be determined by a trial, how far galvanism is capable of counteracting the offending cause, and that without the smallest risk, because we know to what extent galvanism can be safely employed in the human body.

The other circumstance which tends to render my expectations from galvanism less sanguine, is that, if it be capable of counteracting the offending cause, it is doubtful whether the degree in which it can be safely employed is sufficient for this purpose. In supporting the function of a vital organ, when it is deprived of its nervous power, a very considerable galvanic power is necessary. It is not to be supposed that in our clumsy mode of applying it, the same degree of power will be sufficient, as when applied by nature herself.* This

* I here speak of the nervous and galvanic powers as identical. Of their identity, as far as I am capable of judging, the facts which have been laid before the public leave no room to doubt. If it can be proved that the nervous power can exist in other parts of nature, beside the organs of the nervous system; and that there is a power existing in other parts of nature, capable of *all* the functions of the nervous power, that power, I conceive, must be regarded as identical with the

objection, however, relates only to the degree of benefit to be expected from it.

The way in which it was employed in my experiments, which has become general, and seems to have been adopted by Mr. Finlayson, is not the proper mode of applying it in the disease before us. Wires from the positive end of the trough should be applied to various parts of the head, and along the whole course of the spine, and wires from the negative end to various parts of the chest and abdomen. The precautions I have observed in directing its application to more than a hundred patients, in none of whom it was productive of any injury, farther than occasionally exciting a slight inflammatory tendency, which was in every instance easily relieved, were that it should not be employed in a degree which produced such pain as the patient complained of, and that its application should not be continued for more than ten minutes or a quarter of an hour at a time; and this I have seldom seen repeated more than twice in 24 hours. Its repetition of course must be regulated by its effects, and the urgency of the symptoms. I have reason to believe that with proper care it may be safely repeated at much shorter intervals.

With the means directed to the general cause of the evil, we must often combine such as tend to allay particular injurious and distressing symptoms. The diarrhœa is to be allayed by opiates and astringents. If the patient be plethoric, bleeding by leeches from the abdomen, and if the diarrhœa be attended with cold sweats, cordials and the sulphate of quinine are recommended by Drs. Russell and Barry. I have already had occasion to warn against large doses of opium: we find the best practitioners cautioning against them. Their bad effects the reader will easily understand, when he recollects the depression which succeeds

nervous power. These points have been generally admitted as proved, the experiments on which they rest having been so frequently repeated, both in London and Paris, as to convince all who witnessed them; many of them men in the highest ranks of science, of their accuracy.

their first effects. The spasms of the limbs are to be allayed by antispasmodics, friction, mild opiates, cupping on the spine, and such other means as are found to allay this symptom in other cases. Drs. Barry and Russell found subnitrate of bismuth useful for this purpose. Its power in allaying the tendency to spasmodic pain of the stomach is well known. The thirst, which is a distressing symptom, should be allayed by moderate draughts. The excessive use of liquids tends to increase the oppression. It has been recommended to acidulate the drink with nitrid acid.

In severe cases of malignant cholera, it is requisite to prevent all voluntary motions of the body, and all deviations from the horizontal position. The neglect of these precautions, for reasons which the reader will easily understand from what has been said, has often proved immediately fatal.

THE principles on which the treatment of the second class of cases is founded are less simple, and more judgment is required in their application. It appears from the facts which have been laid before the reader, that the following is the state of the system when the cause of the disease has not been powerful enough equally to debilitate the functions of every part, but sufficiently so greatly to debilitate those parts which are most under the influence of the nervous system.* Under such circumstances, the capillary vessels of the vital organs, we have seen, chiefly suffer from their intimate connection with that system; and if no peculiarity of constitution or other circumstance operate tending to cause those of particular organs to suffer most, and consequently to yield most to the force of circulation, and thus relieve other parts, a general tendency to distension of the capillary vessels, that is to an inflammatory state, of all the vital organs, namely, of those organs which most sympathize with the state of the nervous system, necessarily ensues.

While the effect of the first impression on the heart and

* The reader will here excuse some repetition, which is necessary for the sake of perspicuity.

vessels continues, the powers of the circulating system are so infeeblled, that little distension takes place in the most debilitated vessels ; but, as I have already had occasion to observe, as soon as these powers begin to rally, and consequently the force of the circulation to increase, that is, according to the common expression, some degree of re-action to take place, the most debilitated vessels begin to be morbidly distended, and thus a general inflammatory affection of the vital organs arises.

It is then that the physician is called upon so to regulate the returning powers of circulation, that on the one hand the inflammatory affection of the vital organs may not, by the increasing distension of their capillaries, become such as wholly to destroy their powers ; and on the other, that those of circulation may not be so impaired, as to be incapable of supporting any motion of the blood in these vessels. The great danger consists in so many parts, and those, from the very nature of the cause which has produced the inflammation, necessarily the most vital, being affected ; and the general debility produced by the first attack, and continued influence of the offending cause, being such as to make great caution requisite in checking the returning force of circulation ; for it is never to be lost sight of, that this re-action of the system, although apt to go too far, and therefore requiring to be restrained, is a salutary effort of nature. It is at once the means of exciting the debilitated nervous system, and both of supporting circulation in the inflamed parts, and exciting their debilitated vessels.

A circumstance which here tends farther to perplex is, that the effect of blood-letting is not always that of reducing the force of circulation ; and therefore the degree of excitement is not always the measure of the necessity of blood-letting. When the quantity of blood to be moved is too great for the powers which move it, blood-letting increases the action of the heart and blood vessels. This happens in all severe inflammatory affections of the stomach and bowels, which from the impression they make on the nervous system, and

through it on the heart and blood vessels, greatly debilitate their powers, so that the patient often dies from this cause alone, before the inflammation itself has time to run to any of its fatal terminations. Hence it is, as every physician knows, that in such cases the pulse always rises on blood-letting; the patient being relieved from a state approaching to fainting, in consequence of the loss of blood relieving the irritation which had produced it. This state and the means which relieve it are equally inexplicable, except by the immediate influence of the nervous system on the heart and blood vessels. Thus in determining the propriety of blood-letting, and the extent to which it should be carried, we are as much influenced by the nature of the organs affected, as by the degree of the excitement.

It appears from all that has been said, that in the employment of blood-letting in the case before us, much depends on the judgment of the physician; and we cannot be surprised that in a disease so little understood, its effects have been so various, that while some praise it as our best resource, by others it is altogether condemned. As it is probable that in some places and certain times, the tendency to general debility will be greater than in others, blood-letting from this cause will not always be equally successful. From the whole of our experience, however, in other cases, as well as our present confined experience in the malignant cholera itself, we have reason to believe that in a large proportion of the cases I am now speaking of, the cautious employment of it, when a marked re-action takes place, is proper, and in many essential to the cure. Causes lessening the quantity of blood have no share in producing the disease; and it is reasonable to suppose that, if we choose a proper time for it, so lessening its quantity, as better to adapt it to the weakened powers of circulation, must be beneficial. As in other similar cases the physician must be guided by the degree of excitement and the nature of the parts chiefly affected, on the one hand, and the remaining strength of his patient on the other; and above all,

in regulating the repetition of the blood-letting, by the effects it produces.

With respect to saline and other medicines which assist blood-letting in reducing the force of the circulation, their sedative effect on the nervous system seems here to preclude their employment. All means which determine to the surface without increasing the debility are still proper, and the due regulation of the bowels, where the disease is protracted, is indispensable. On the disputed point of the employment of calomel, I shall have occasion to make some observations in the division of the subject, on which I am about to enter, the cases in which from peculiarity of constitution or other causes the inflammatory state particularly affects certain organs. In the case now before us, local blood-letting, blistering, &c. of the head, chest, or abdomen, according as the symptoms are more or less urgent in each of these cavities, will often aid the general means; but it is when the disease chiefly affects particular organs, that most is to be expected from them. In all cases we have reason to believe that counter-irritants as near as possible to the chief seat of the disease, will always prove an essential part of the treatment. The more the inflammatory state prevails, we must be the more cautious in the employment of galvanism.

WHEN it appears from the symptoms that the inflammatory affection is chiefly seated in particular organs, it is almost superfluous to observe that the treatment adapted to the local affection, must be combined with the general plan. Local blood-letting, blistering, &c., in the region of these organs then form important parts of the treatment, and should be employed from the first appearance of determination to particular parts, not only because they are often more powerful in local affections than any general measures, but because by rendering less powerful general measures effectual, greatly save the strength. There is reason to believe that local blood-letting, from the head and spine,

in all cases except the most extreme, would be beneficial, and that the sooner it is employed it will be the more so.

When the determination is to the hepatic system, mercurials are a necessary addition to our other means. But I think we have reason to believe that it is only under such circumstances, with the exception of the occasional employment of calomel as an active purgative when such is required, that they will prove beneficial in malignant cholera. It appears to be the great tendency to affections of the liver in sultry climates, which renders mercurials so much more beneficial there than they have been found in Europe; and we have reason to believe that when there is no such determination, the relief of which will certainly compensate for any harm they are otherwise calculated to do; their effects, when employed to any considerable extent, on the nervous system, will always render them prejudicial in this disease.

Those who have made the nature of disease their study, will not be surprized to find it so modified by circumstances, and nothing is more powerful than climate, that what under some, constitutes our chief reliance, under others, only adds to the evil. In the more protracted cases of cholera, accompanied by local determination, the fate of the patient must chiefly depend on the relief afforded to the part, which is always a vital one, that chiefly suffers. It will not therefore appear surprizing that when the influence of climate determines that part to be the liver and its appendages, means which relieve them, even although otherwise prejudicial, should be essential to recovery.

WITH respect to the last division of the subject, the cases of fever succeeding malignant cholera, occasioned by the great irritation the system has undergone, they must be treated on the same principles as other fevers of the same description; the physician bearing in mind that the source from which they spring has strained every power of the constitution.

THE END.